

# Biotic Sources and Physical Transport of Contaminants

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## Biotic Sources

Anadromous fish and migratory birds are possible biotic sources of contaminants. Because these species are highly mobile, they could be exposed to contaminants outside of the refuge boundaries. When these species return to the refuge, they may be vectors for contaminants and may impose contaminant-related risks to other refuge resources and humans.

A study conducted by Ewald et al. (1998) documented the biotransport of contaminants, such as DDT and PCBs, by a population of sockeye salmon in Copper River, Alaska. The salmon accumulated relatively low levels of contaminants during their ocean life stage and transported contaminants to their freshwater spawning areas. The results of the study suggested that other species, like arctic grayling (*Thymallus arcticus*), may accumulate contaminants that are transported by sockeye salmon into freshwater ecosystems.

Migratory birds may be exposed to an array of potentially toxic chemicals on their wintering grounds in the lower 48 States and in other countries, including chemicals that are banned or no longer used in the United States. During the spring migration, birds may transport these contaminants to their nesting grounds in Alaska. This migratory transport of contaminants provides a potential exposure pathway to other organisms which would otherwise likely not be exposed to these chemicals.

Currently, it is not known if biotic transport is a contaminant pathway affecting refuge resources.

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## Physical Transport

Environmental contaminants from local and distant sources are subject to short and long range transport. Arctic and sub-arctic environments are especially vulnerable to the long-range air and water transport of environmental contaminants because once chemicals reach colder climates, less volatilization occurs. Some environmental contaminants of particular concern within the Arctic are persistent organic pollutants (POPs), such as PCBs, dioxins, dichlorodiphenyltrichloroethane (DDT), hexachlorocyclohexane (HCH), chlordanes, toxaphene, mirex and dieldrin; heavy metals, such as cadmium, mercury, lead; polycyclic aromatic hydrocarbons (PAHs) and radionuclides.

There is some evidence that the KNWR may be exposed to contaminants from off-site sources. PCBs (Aroclor 1254 and/or 1260) have been detected in low concentrations in snowshoe hares, shrews, clams, slimy sculpins, rainbow trout and arctic char on KNWR (Ecology and Environment, Inc., 1986). To date, there is no documentation that these aroclors were used on the refuge. The most likely source of these aroclors is atmospheric deposition.